ALTA GEOSCIENCES, Inc.

Environmental & Geotechnical Solutions

FIELD SAMPLING/ QUALITY ASSURANCE PROJECT PLAN

MOA Parcel 3, Tract B, Municipal Industrial Subdivision
ADEC File No. 2100.38.504

Prepared for:

MUNICIPALITY OF ANCHORAGE

Heritage Land Bank

April 2010

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ACRONYMS & ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
CSM	conceptual site model
DQI	data quality indicator
DQO	data quality objective
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
LCS	lab control sample
MRL	method reporting limits
MS/MSD	matrix spike/matrix spike duplicate
MSL	mean sea level
NIST	National Institute of Standard and Technology
PID	photoionization detector
PQL	practical quantitation limit
QA	quality assurance
QAP	laboratory quality assurance plan
QC	quality control
FS/QAPP	Field Sampling/Quality Assurance Project Plan
RPD	relative percent difference

1.0 INTRODUCTION

This *Field Sampling/Quality Assurance Project Plan* (FS/QAPP) establishes the technical standards and procedures for soil sampling and analysis at the Heritage Land Bank, Reeve Boulevard site (MOA Parcel 3, Tract B, Municipal Industrial Subdivision). This plan specifically relates to the Site *Self Implementing Cleanup Plan – Reeve Blvd. Site* developed by ALTA (March 2010).

This FS/QAPP describes the field methods for implementing soil sampling tasks required by the Cleanup Plan and ADEC Guidance. Addendums will be added to this FS/QAPP to address additional activities as required.

Sampling and analysis will be performed in general accordance with the *Contaminated Sites Regulations* (18 AAC 75) and the *Draft Field Sampling Guidance* (January 2010), as applicable.

This document has been prepared by Alta Geosciences, Inc. for the Heritage Land Bank, Municipality of Anchorage, which is responsible for conducting investigation and remediation at this site.

2.0 QUALITY ASSURANCE/QUALITY CONTROL

This quality assurance/quality control plan is developed to ensure that field and laboratory data are technically sound, statistically valid, and properly documented. The acceptance criteria for the data quality indicators are expressed in terms of precision, accuracy, and completeness that represent an acceptable level of uncertainty for current and future uses of the data.

2.1 DATA USES

The soils data collected under this plan are to be used for:

- Characterizing soil in grid square layers, as described in the Clean-up Plan, for purposes of Remediation by excavation and offsite landfill disposal, or backfilling onsite followed by capping
- Monitoring soil excavations to determine when excavation is complete
- Demonstrate that cleanup goals have been met in all relevant grid squares (within the area designated by ADEC for remediation)

2.2 DATA QUALITY OBJECTIVES (DQOs)

The DQOs for the sampling program are to:

- Ensure that testing data are within acceptable limits of precision and accuracy for the uses described in Section 2.1
- Minimize the possibility of loss, damage, or tampering with the data
- Generate and maintain sufficient records to document the collection, transport, and analysis of each sample.

2.3 DATA QUALITY INDICATORS (DQIs) AND ACCEPTANCE CRITERIA

Data quality indicators (DQIs) will be used for various aspects of data gathering, sampling, or analysis activity. The allowable levels of uncertainty associated with each DQI measurement (acceptance criteria) are defined in the following paragraphs and summarized on Table 1.

2.3.1 Cross-Contamination

Method blank samples. Method blanks are used to confirm that samples are not cross-contaminated during sample extraction or analysis. The number of method blanks is method-specific.

Method blank samples should not contain detected analytes or corrective actions are required (Section 2.10).

2.3.2 Accuracy

Matrix spike samples. Accuracy is a measure of the closeness of a measured value to the true value. Bias associated with sampling, the analysis, and the matrix is assessed by analyzing duplicate matrix spike samples and calculating matrix spike recovery to evaluate overall accuracy. Matrix spike and matrix spike duplicates (MS/MSDs) consist of a known quantity of a National Institute of Standard and Technology (NIST) traceable standard containing all analytes of interest that is added to the sample.

MS/MSDs will be collected at a rate of one for every 10 field samples.

MS/MSD recoveries should be within method-specified limits or corrective actions are required (Section 2.10).

Temperature blanks and holding times. Temperature blanks and holding times are used to determine the integrity of the samples.

Temperature blanks will be included with each sample shipping container.

Samples for volatile analysis must be held at 4º± 2ºC, and all samples must be analyzed within technical holding times. Professional judgment is used to evaluate the effect of any exceedence of sample hold temperatures or hold times and the need for corrective action.

2.3.3 Precision

Field duplicate samples. Precision is a measure of the reproducibility of replicate data. Overall soil sampling precision is assessed with field duplicates which include variability in sampling, the matrix, and the analysis. Field duplicates are used to determine overall precision of sampling and analysis as well as matrix heterogeneity. Field duplicate precision is assessed by calculating the relative percent difference (RPD) of two detectable duplicate sample measurements.

Field duplicate samples will be collected at a rate of one for every 20 field samples.

The RPD limits for field duplicates will be established on a site-specific basis.

2.3.4 Analytical Performance

Lab control samples (LCS). Lab control samples are reagent water that is fortified with a known quantity of the analytes of interest and are used to assess the method efficiency. The analytical process is considered to be in control if recovery values for the added compounds fall within specified limits. Recovery values that are not within specified limits signal the need for procedure evaluation.

Calibration verification standards. Instrumentation and equipment used for sample processing and analysis are calibrated to ensure that accurate analytical results are generated. Prior to sample analysis, calibrations are analyzed and evaluated against the specified acceptance criteria and calibration verifications are also analyzed throughout the analytical sequence to ensure that instrument performance continues to meet acceptance criteria.

2.3.5 Completeness

Completeness. Completeness refers to the percent of valid usable data actually obtained relative to the amount that was expected. A variety of circumstances (broken bottles, lost samples, instrument failure, laboratory mistakes, etc) can result in acquiring less than 100 percent of the planned data. The minimum percent of completed data acquisition depends on how much information is needed for decision making. Generally completeness goals increase when fewer number of samples are taken per event or the data are critical for decision making. EPA (2000) reports that completeness goals are typically in the 75 to 95 percent range.

2.4 TARGET ANALYTES

The target analytes for work at the Reeve Blvd site are Polychlorobiphenols (PCBs).

2.5 METHOD REPORTING LIMITS

Method reporting limits (MRLs) are shown on Table 2 and are less than the Alaska Department of Environmental Conservation (ADEC) cleanup criteria for soil contained in 18 AAC 75.

2.6 ANALYTICAL METHODS

The approved analytical method is EPA Method 8082, as shown on Table 2. Conformity with the published standard methods is mandatory with few exceptions. The laboratory must clearly designate the analytical method for each sample and may deviate from the published methods only if:

- It is necessary or appropriate (*i.e.,* due to the nature or composition of the sample).
- Deviations are consistent with recognized standards of the industry and the DQOs of this plan.
- Method deviations are indicated on the report sheets (*i.e.,* the method reference indicates a modified method).
- Modifications to methods are fully described in the laboratory standard operating procedures.

- Method deviations are accompanied by qualified results and an explanation in the case narrative.

2.7 PROJECT LABORATORY

All samples for this project will be sent to the following primary laboratory:

SGS North America, Inc.

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.us.sgs.com

2.8 LABORATORY QUALITY ASSURANCE AND REPORTING REQUIREMENTS

The analytical laboratory used during this program must conform to the policies and procedures set forth in the laboratory's quality assurance plan (QAP). At a minimum, the QAP must contain the following elements:

- Statement of QA policy and objectives
- QA management and responsibilities
- Personnel qualifications and training
- Facilities and equipment
- Documentation and records
- Sample control
- Analytical methods
- Instrument control
- Data reduction, reporting and verification
- Quality control sample analysis and evaluation
- Corrective actions.

The laboratory is required to provide printed data summary packages that meet ADEC's requirements for laboratory reports and the analytical results in electronic data deliverable (EDD) format.

2.9 DATA VALIDATION

2.9.1 Field Data

The field manager will examine all information collected during field activities and check it for:

- Completeness
- Accuracy (for example, transcription errors, internal consistency)
- Unexpected results, with accompanying possible explanations
- Adherence to sampling procedures outlined in Section 3 of this chapter
- Comparison of field screening results with laboratory results.

A sample will be considered invalid if it:

- Was not collected by or supervised by a Qualified Person as required by 18 AAC 78
- Was collected with previously-used tools that were not decontaminated as specified in Section 3.4
- Was not taken at the location or depth specified by the site-specific work plan
- Was not taken at a location determined by a correctly calibrated and operated field instrument
- Was collected using a method not listed in Section 3, the site-specific work plan, or other method appropriate for the analyte
- Was composited before analysis, unless compositing of the sample is explicitly specified in a site-specific work plan approved by ADEC
- The sample jar was not clean before soil was deposited into it
- Was incorrectly labeled (or not labeled) and field records do not show the location where the sample was collected
- Analyzed using an improper analysis method
- Analyzed by a laboratory that is not approved by ADEC at the time of analysis.

2.10 LABORATORY DATA

A quality assurance (QA) summary will be submitted with each report to ADEC. The QA Summary will review all laboratory results, including laboratory QC sample results, for quality, validity, and usability. The QA Summary will follow ADEC's requirements[1] and will

[1] ADEC, 2006, *Environmental Laboratory Data and Quality Assurance Requirements*, Technical Memorandum 06-002, May 18, 2006.

describe the following parameters for all analytical results and assess the impact of any discrepancy upon the quality and usability of the data.

Precision
Field duplicates
RPD for LCSs or MS/MSDs
Accuracy
Percent recovery for LCSs and/or MS/MSDs
Percent recovery for surrogates
Representativeness
Degree to which data characterize actual site conditions
Consistency with conceptual site model (CSM) and DQOs
Comparability (if applicable)
Field screening vs lab data correlations
Between labs if more than one used
Completeness
Sensitivity
Limits of detection meet cleanup levels and/or project required goals
Blank results less than PQL.

2.11 CORRECTIVE ACTIONS

Corrective action will be initiated when the DQOs of this plan are not met. Field and laboratory personnel are trained to recognize and report out of control conditions to the Project Manager and the laboratory project manager, respectively. Personnel are authorized to stop work until the need for corrective action is assessed. Corrective actions are initiated when conditions are identified that may impact data collection or data quality. Events that may initiate corrective action include:

- Deviation from established field procedures
- Deviations from analytical methods or standard operating procedures
- Violation of field or analytical quality controls
- Results of field and laboratory comparisons.

The Project Manager and the laboratory project manager will take the necessary steps to resolve out of control conditions and demonstrate acceptable performance of the field procedure or analytical method. Corrective actions may take various forms but usually include one or more of the following:

- Calculation checks
- Verifying instrument operation

- Recalibration
- Re-sampling
- Reanalysis of control check and/or samples
- Qualifying results
- Modification of procedures
- Additional personnel training
- Analysis of performance evaluation samples.

Field nonconformance events and corrective actions are documented in the field notes and the data validation report. Laboratory nonconformance events and accompanying corrective actions are documented in the laboratory notebooks and in the case narrative accompanying the final data report. Qualified results are discussed in the data validation report.

Conformance with quality controls and the adequacy of corrective actions are evaluated during data validation. Additional corrective actions may be initiated during data validation including re-sampling, reanalysis, data qualification, or data rejection. A discussion of any non-conformances and any associated corrective actions is included in the data validation narrative along with the expected effects on data usability.

2.12 DATA MANAGEMENT

The original monitoring records (sampling logs, chain-of-custody forms, analytical data reports, equipment maintenance records) will be retained by Alta Geosciences for a minimum period of three years. In addition, the laboratory retains all analytical records for a minimum period of five years after delivery of the final data report.

3.0 FIELD SAMPLING PROCEDURES

3.1 FIELD DOCUMENTATION

A field log book or other type of field record will be used to document sample collection and various site data. These records will include such items as:

- The name of each Qualified Person on site supervising or conducting a characterization, assessment, or investigation
- The date and time of sampling
- Weather conditions, including temperature, wind speed, and precipitation
- The name of the person who physically collects each sample
- Photographs of the site
- Site sketches to show sampling locations, sample depths, field instrument readings, and corresponding sample ID numbers. The sketches should include a scale and north arrow.

3.2 SAMPLE LOCATIONS

All sample locations will be keyed to the remediation grid system as shown on Figure 3 of the Cleanup Plan, and plotted on the site base map. Each grid square is 20 feet by 20 feet.

Procedures call for selection of a random sample location within any given grid square to be sampled. A subgrid of four rows and four columns, producing individual 5 feet by 5 feet subgrids, will be designated. Each subgrid will be numbered from 1 in the upper left to 16 in the lower right as indicated below. Prior to sampling, a random number table with numbers between 1 and 16 will be consulted to pull the next random number, which will designate the subgrid location of a sample within any given grid square. The subgrid number will be part of each sample number.

1	**2**	**3**	**4**
5	**6**	**7**	**8**
9	**10**	**11**	**12**
13	**14**	**15**	**16**

3.3 EQUIPMENT CALIBRATION

All equipment will be calibrated according to the manufacturer's recommendations. In addition:

- Field instruments will be calibrated onsite, if possible.
- The dates, times, and results of calibrations and repairs to field instruments will be recorded in the field record and in the instrument's log.
- Users of the field instruments will be trained in the proper calibration and operation of the instrument.
- All users of the instrument will be trained in routine maintenance, including battery and lamp replacement, lamp and sensor cleaning, and battery charging.
- Each instrument's operation and maintenance manual will be present at the site.
- Field instruments will be inspected before departure for the site and on site.
- Instrument battery charge will be inspected far enough ahead of time to bring the instrument up to full charge before departure for the site.
- A source of extra batteries and lamps (if applicable) will be readily available.

3.4 EQUIPMENT DECONTAMINATION

Pre-cleaned disposable sampling equipment will be used to the extent possible. All previously used sampling equipment will be decontaminated before sampling and between sampling locations to prevent introduction of contamination into uncontaminated samples and to avoid cross-contamination of samples.

Soil sampling tools will be cleaned and decontaminated using the following three-step procedure:

- Scrub with a stiff brush in a solution of hot water and laboratory-grade, cleaning detergent such as Alconox or a similar product
- Rinse twice in clean water
- Thoroughly rinse with distilled or deionized water.

If concentrated petroleum products or highly contaminated soils are encountered during sampling excessively contaminated sampling equipment shall be disposed of.

3.5 FIELD SCREENING TESTS

Ensys test kits may be used to verify that laboratory confirmation testing is warranted, in other words, that the grid square excavation is complete. Information provided on the test is as follows:

Technology Description

U.S. EPA Method 4020, Soil Screening for Polychlorinated Biphenyls by Immunoassay, U.S. EPA Office of Solid Waste, SW-846 Method Revision Draft 1, October 1992.

The technology is an enzyme immunoassay for fast, semi-quantitative field measurements of polychlorinated biphenyls (PCBs, as Aroclors) in soil. The reaction is performed on a methanol extract of a small sample of the soil. The EnSys system offers one or more semi-quantitative detection levels which can be customized for each project. The minimum detection level is 1 ppm for Aroclor 1248 with lower minimum detection levels of 0.4 ppm for Aroclors 1254 and 1260. The lowest detection level for a particular situation can be set at or above the minimum detection level. The second (and third, if needed) detection level can be set at higher levels by a factor of four or more, while maintaining the claimed accuracy and precision up to a maximum detection level of 500 ppm in soil. The manufacturer provides testing reagents and utensils, including a sample weighing balance and a photometer for field use, a user manual, material safety data sheets, field data recording forms, and instruction in the use of the testing system.

It is important to note, the field tests may force additional excavation adjacent or below completed, planned excavations, but under the ALTA system, they do not provide final confirmation. That requires sampling and laboratory testing to confirm that remediation goals have been met. Any of the sample collection procedures (Section 3.6) used for laboratory samples may be used for field ENSYS sample collection.

3.6 SOIL SAMPLE COLLECTION

3.6.1 Surface/Subsurface Soil Samples

Samples will be collected from excavations made using hand tools, a backhoe test pit, or other means. Representative material will be taken from the sidewall of an excavation using a stainless steel spoon or trowel, placed in a stainless steel bowl, mixed and split down to the sample size by quartering.

3.6.2 Soil Boring Soil Samples

Relatively undisturbed soil samples will be collected using a split-spoon sampler. Slough and other disturbed soil will be avoided so that only undisturbed soil is collected for laboratory samples. A clean spoon or trowel sampling tool will be used to quickly transfer the sample from the split-spoon to the sample container with a minimum of disturbance. The rim of the sample container will be cleaned, and the container will be quickly capped and sealed. The sample container will be handled and labeled as described in Section 3.8.

3.6.3 Duplicate Soil Samples

Duplicate samples (except for duplicate samples for volatile analyses) will be obtained by collecting twice as much sample as normally required for a sample and placing the material in a decontaminated or new disposable bowl or plastic baggie. The sample will be thoroughly mixed and then the sample and duplicate sample jars will be filled, capped, and labeled appropriately.

Duplicate samples for volatile analytes will be obtained by collecting soil as close as possible in space and time to the characterization sample.

The duplicate sample number and other relevant information will be recorded in the field notes or sampling form.

3.6.4 MS/MSD Samples

Soil samples for MS/MSD analysis will be collected in the same manner as duplicate samples (Section 3.7.4).

3.7 SAMPLE HANDLING

3.7.1 Sample Containers, Preservation, and Holding Times

Tables 2 lists the appropriate containers and handling requirements for analysis of soil samples.

Sample containers will be inspected before transit to the site to ensure that they have undamaged lids and are tightly sealed. Containers and lids will be re-inspected at the job site, and containers that have lost lids or have been damaged will not be used for holding laboratory samples.

3.7.2 Sample Identification System

The following site codes will be used for the sample labeling system:

Reeve Blvd .....RB

The following sample type codes will be used for the sample labeling system:

Boring ..... B

Surface soil.....SS

Hand Auger.....HA

Test Pit.....TP

Hand Exc.....HE

Remediation Confirmation.....Grid Square Number (row & column) and depth

Borings will be numbered sequentially at each site using the same system as for the site investigation work, except that a grid square designation will be added during the remediation work. For example, the fifteenth soil boring performed and a sample from 20-21 feet in grid square A4, subgrid 12 will be identified as RB-*B15, 20-21', GSA4-12*.

Soil sample identifiers will contain the soil excavation identifier, plus the sample depth (in feet), plus the grid square information. For example, the sample collected from the 10-11 foot level in test pit No. 7 would be designated RB-TP7, 10-11', GS B3-4.

Duplicate samples will be numbered using the same numbering scheme as for the sample type.

3.7.3 Sample Labels

Indelible, waterproof ink will be used to label sample containers. The sample labels will be securely fastened to the container. All information entered onto the label or container will be duplicated in the field log book. Information on the containers or labels will include:

- Unique identification number assigned to the sample for laboratory analysis
- Date and time of collection
- Collection firm's project name and number
- Initials of person who collected the sample
- Preservation method.

If possible, the following information should also be included on the container or label:

- Intended laboratory analysis.

3.8 CHAIN-OF-CUSTODY AND SAMPLE SHIPMENT

Chain-of-custody (COC) procedures will be used to document sample possession from the time of collection to disposal. The COC form will contain, at a minimum, the following information:

- Site identification
- Sample identification
- Date and time of collection
- Sample matrix
- Number of containers
- Analyses to be performed
- Identification of sample collector

- Shipping destination
- Signature and dates of all sample custodians.

Sample will be stored in a clean cooler with an interior temperature of at ~4°C immediately after they have been collected, labeled, and logged. A temperature blank will accompany all sample shipping containers.

The samples will be packaged to adequately protect the sample containers from accidental breakage during transport. Glass sample containers will be placed into plastic bubble-wrap, and the cooler itself will also be lined with layers of bubble wrap. Additional packaging material will be inserted as required to prevent movement of the bottles. Blue ice (or ice if blue ice is not available) will be placed in the container in a manner that provides adequate and equal cooling for all samples. A signed and dated chain-of-custody form will be taped to the inside of the cooler lid, a custody seal will be affixed to the outside of the shipping container, and drain holes will be secured with duct tape before shipping. A copy of the COC will be retained by field personnel and filed in the project files at the end of the field project.

TABLES

Table 1. Data Quality Indicators and Acceptance Criteria

QC Indicator	Frequency	Description	Purpose	Acceptance Criteria
Method blanks	Method specified	Reagent water carried through extraction and analysis procedures	Assess cross-contamination during extraction and analysis	No detectable analytes
Matrix spikes	One per twenty field samples	Groundwater samples from the site that have been fortified with a known quantity of the analytes of interest	Assess the accuracy of sampling and analysis, and matrix heterogeneity	Recovery within Shewhart control chart limits
Field duplicates	One per ten field samples	Two discrete samples collected within the closest practicable space and time	Assess the precision of sampling and analysis, and matrix heterogeneity	Relative percent difference within project specifications
Lab control samples	Method specified	Reagent water samples that have been fortified with a known quantity of the analytes of interest	Assess the performance of the laboratory and method	Recovery within laboratory control limits
Calibration verification standards	Method specified	Mid-range calibration standard containing the analytes of interest	Continuously compares instrument performance to that of initial calibration	Recovery within laboratory control limits
Completeness	Each sampling event	Percent valid data obtained compared to the amount expected	Assess the need for additional monitoring	85% for analytical data; 85% for water level data

Table 2: Sample handling requirements for soil samples

Parameter	Preparation/ Analytical Method	Method Detection Limit	Practical Quantitation Limit	Container	Preservation	Holding Time
Polychlorinated biphenyls (PCBs)	8082	0.01 mg/kg	0.05 mg/kg	4-oz. amber glass, TLC	Cool $4^{o} \pm 2^{o}C$	14 days to extraction, less than 40 days to analysis of extract